[0068]

I CLAIM:

1. A tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle portion and said barrel portion, wherein said barrel portion has variable stiffness along its length.

2. A bat according to claim 1, wherein said variable stiffness is achieved by adding a polymer composite material stiffener to the said barrel portion.

3. A bat according to claim 2 wherein said polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.

4. A bat according to claim 2 wherein said stiffener has a length less than 50% of the said barrel portion length and adds less than 2 oz. to said bat weight.

5. A bat according to claim 2 wherein said stiffener is located internally, and/or externally to said barrel portion, and/or between members of double-walled or multi-walled bats, or combinations thereof.

6. A bat according to claim 2 wherein said stiffener is bonded full length to at least one bat barrel member.

7. A bat according to claim 1, where said stiffness is radial stiffness.

8. A polymer composite tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle portion and said barrel portion, wherein said barrel portion is

radially stiffer in the middle of the said barrel portion and circumferentially less stiff radially in the two end portions of the said barrel portion.

9. A bat according to claim 8 wherein said polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.

10. A polymer composite baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle and barrel portion, wherein the radial stiffness of said barrel portion is highest in the said barrel portion's middle area, lowest at the ends of the said barrel portion, and generally uniformly changes from the middle portion to each end portion of said barrel portion.

11. A bat according to claim 10 wherein a polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.

12. A tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle and barrel portion, wherein said barrel portion's thickness varies over said barrel portion's length.

13. A bat according to claim 12 wherein said barrel portion's thickness is at least 5% thinner, at either or both end portions of said barrel portion, than the central portion of said barrel portion.